

REMARKS

In the Office Action mailed November 20, 2003, claims 34-60 were rejected under 35 USC §103(a) as being unpatentable over the admitted prior art in view of U.S. Patent 6,179,691 to Lee et al.

Applicants amend the specification to update information that is now available to applicants. No new matter is added. Applicants withdraw claims 1-33 without prejudice in view of the Examiner's earlier restriction requirement; applicants retain the right to present claims 1-33 in a divisional application.

Applicants amend claims 34-39, 45-57, 59-60 to more clearly recite the present invention. New claims 61-65 are added.

§103

Claims 34-60 were rejected under §103 as obvious in view of admitted prior art and Lee et al. Under the Graham test, three factors must be evaluated: the scope and content of the prior art; the differences between the prior art and the claimed invention; and the level or ordinary skill in the art. (MPEP 706 and 2141 et seq.).

The admitted prior art discloses that a CMP process is a costly and a time consuming process that reduces production efficiency. Accordingly, the CMP process may be minimized or overcome by employing a processing approach of the present invention. (see specification page 3, lines 1-8)

The principal objective of Lee et al. is to provide a method of endpoint detection for copper CMP. Lee et al. also cites U.S. Patent 5,836,805 for CMP endpoint method by analyzing the waste slurry; US Patent 4,147,564 for ionizing radiation after a polishing step; U.S. Patent 5,722,875 for a Cu CMP with endpoint with temperature; and U.S. Patent 5,637,185 for a CMP endpoint process based on conductivity of waste slurry. (see Col. 4, lines 5-20 and lines 24-25) Lee et al. is concerned with detecting the thickness of a previously deposited metal layer during CMP, which is a material removal technique. In contrast, the present invention is concerned with detecting the degree of planarization of the material being deposited.

For example, independent claim 34 recites:

... depositing the conductor to fill features within the top surface of the workpiece using electrochemical mechanical deposition employing a workpiece surface influencing device, an applied potential and the solution;

transmitting a beam of light onto the top surface of the workpiece to obtain a reflected beam of light, a characteristic of the reflected beam of light being altered by a top surface pattern that exists due to the features within the top surface of the workpiece; and detecting a change in the characteristic of the reflected beam of light indicative of a degree of planarization to the top surface of the workpiece.

Claim 34 recites a unique combination that includes depositing the conductor to fill features with a workpiece surface influencing device, an applied potential and the solution using electrochemical mechanical deposition, transmitting a beam of light to obtain a reflected beam of light, and detecting the reflected beam of light indicative of a degree of planarization to the top surface. The recitation of independent claim 34 is neither taught nor suggested by the references alone or in combination. Claim 34 is patentable over the references.

Moreover, applicants submit that the admitted prior art is not properly combinable with the Lee et al. reference because the admitted prior art teaches away or at least minimizes the use of CMP processing. Even in light of the forced combination of the prior art with Lee et al, there is no suggestion that would lead an artisan in the art to combine the teachings. The present invention is concerned with deposition and planarization of deposited material during the deposition. Lee et al. on the other hand is concerned with copper removal and detection of the copper removal process. Lee et al. monitors the level of radioactivity emitted by the copper layer as it is removed. (see col. 4, lines 40-46)

In contrast, independent claim 34 recites a unique combination that includes depositing the conductor to fill features, transmitting a beam of light, and detecting the reflected beam of light indicative of a degree of planarization to the top surface that is not taught or suggested by the references.

Independent claim 45 recites:

...electrochemically mechanically processing the top surface of the workpiece using a workpiece surface influencing device, an applied potential and the solution to deposit material onto the top surface;

transmitting a beam of light onto the top surface of the workpiece to obtain a reflected beam of light, a characteristic of the reflected beam of light being altered by a top surface pattern that exists due to the features within the top surface of the workpiece; and detecting a change in a characteristic of the reflected beam of light indicative of a degree of planarization to the top surface of the workpiece.

Independent claim 45 recites a unique combination that includes electrochemically mechanically processing using a workpiece surface influencing device, applied potential, and solution to deposit

material onto the top surface, transmitting a beam of light to obtain a reflected beam of light, and detecting a change in the reflected beam of light indicative of a degree of planarization. The unique combination recited in independent claim 45 is neither taught nor suggested by the references alone or in combination. Claim 45 is patentable over the references.

Applicants submit that independent claim 52 is patentable over the references. None of the references alone or in combination teach or suggest a method for detecting planarization of a top surface of a workpiece having a plurality of features comprising the steps of depositing the conductor to fill the features within the top surface of the workpiece, and obtaining a signal indicative of a degree of planarity of the top surface.

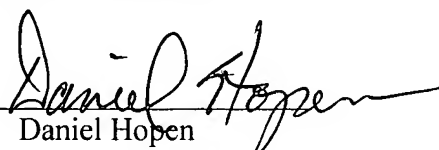
Applicants submit that since the independent claims are not taught or suggested by the references, that the dependent claims are also allowable over the references. Accordingly, applicants respectively request that the 35 USC §103(a) rejection be withdrawn and that the claims be allowed.

Conclusion

Applicants have addressed the concerns of the Examiner in pointing out and distinguishing the present invention with the prior art. The specification is updated with information now available to the applicants. No new matter is added. The claims are amended to more particularly point out and distinctly claim the subject matter which the applicants regard as the invention. The claims are patentable over the art of record. For these reasons, applicant respectfully requests that the Examiner reconsiders and withdraws the rejections of the claims and allows the application. Accordingly, it is respectfully requested that the claims be allowed.

If any matters can be resolved by telephone, applicant requests that the Patent and Trademark Office call the applicant at the telephone number listed below.

Respectfully submitted,

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